EURASIAN EXPERIMENT JOURNAL OF PUBLIC HEALTH (EEJPH)

ISSN: 2992-4081 ©EEJPH Publications

Volume 7 Issue 2 2025

Pharmacological Management of Benign Prostatic Hyperplasia: Reviewing Current and Emerging Drugs

Nasira A. Sitar

Department of Pharmacy Kampala International University Uganda
Email: Satar.nasira@studwc.kiu.ac.ug.

ABSTRACT

Benign Prostatic Hyperplasia (BPH) is a common condition in aging men, characterized by nonmalignant enlargement of the prostate gland, leading to lower urinary tract symptoms (LUTS) that significantly impact quality of life. The pharmacological management of BPH has evolved with the introduction of various drug classes targeting the underlying pathophysiology. This review highlights current and emerging pharmacological therapies for BPH, focusing on their mechanisms of action, clinical efficacy, safety profiles, and potential for improving patient outcomes. Key therapies include alpha-adrenergic receptor antagonists, 5-alpha-reductase inhibitors, and combination therapies that address both symptom relief and disease progression. Emerging approaches, such as novel beta-3 adrenergic agonists, phosphodiesterase-5 inhibitors, and potential role of anti-inflammatory and androgen receptor-targeting drugs, are also discussed. Additionally, the review explores promising developments in targeted and precision medicine aimed at individualizing treatment strategies for BPH patients. Challenges and future perspectives in the pharmacological landscape are addressed to inform clinical practice and stimulate further research in this field.

Keywords: Benign Prostatic Hyperplasia, BPH, pharmacological management, alpha-blockers, 5-alpha-reductase inhibitors, emerging drugs, precision medicine, prostate health.

INTRODUCTION

Benign Prostatic Hyperplasia (BPH) is a non-cancerous enlargement of the prostate gland, commonly occurring in aging men. As men age, the prostate gland undergoes changes that lead to an increase in the number of cells within the prostate tissue, resulting in the enlargement of the prostate, which may obstruct the flow of urine through the urethra.[1–3] This benign growth is a common condition, with a significant proportion of men experiencing it as they reach middle age. The pathophysiology of BPH is complex and involves hormonal changes, particularly an increase in dihydrotestosterone (DHT), a potent metabolite of testosterone, and age-related changes in the prostate. DHT stimulates the growth of both the epithelial and stromal components of the prostate, leading to various urinary symptoms. The process is thought to be influenced by an imbalance between growth-promoting factors (such as DHT) and growth inhibitors within the prostate gland[3, 4].

BPH is highly prevalent, affecting approximately 50% of men over the age of 50 and 80% in men over the age of 80. Despite its high occurrence, not all men with BPH will experience clinically significant symptoms. The symptoms of BPH significantly affect the quality of life of men, particularly as the condition progresses. The enlargement of the prostate often leads to lower urinary tract symptoms (LUTS), which can interfere with daily activities, social engagements, and sleep, leading to emotional distress and decreased overall well-being[4–6]. Untreated BPH can lead to serious complications, particularly if the enlargement of the prostate continues to obstruct the urinary tract. These complications may include acute urinary retention, bladder stones, urinary tract infections (UTIs), and kidney damage. These complications highlight the importance of early detection and appropriate management of BPH to prevent long-term health issues[7–9].

This review aims to examine current pharmacological treatment options for BPH and explore emerging therapies that may offer improved outcomes for patients. Treatment strategies have evolved over the years, with options ranging from lifestyle modifications and pharmacotherapy to more invasive procedures such as surgery. Recent advancements in pharmacology and biotechnology have paved the way for novel treatments, including

the use of phytotherapeutic agents, minimally invasive techniques, and new drug classes that may enhance the management of BPH.

Current Pharmacological Treatments for Benign Prostatic Hyperplasia (BPH)

Benign Prostatic Hyperplasia (BPH) is a common condition in aging men, characterized by an enlarged prostate that can obstruct urine flow and lead to symptoms such as frequent urination, urgency, nocturia, weak urinary stream, and incomplete bladder emptying. The management of BPH involves various pharmacological approaches, with the primary goals being to alleviate symptoms, improve urinary flow, and reduce the risk of complications such as urinary retention or bladder damage[10, 11]. Current pharmacological treatments include alpha-blockers, 5-alpha-reductase inhibitors, and combination therapies. Below is a comprehensive overview of these treatments.

A. Alpha-Blockers: Alpha-blockers are a class of medications that work by relaxing the smooth muscles of the prostate and bladder neck. These muscles are typically constricted due to sympathetic nervous system activity, contributing to urinary symptoms associated with BPH. Alpha-blockers act by blocking alpha-1 adrenergic receptors in the prostate and the bladder, leading to muscle relaxation and improved urine flow. By inhibiting these receptors, alpha-blockers help reduce the resistance to urine flow and improve the symptoms of BPH[12, 13].

Commonly Prescribed Alpha-Blockers

Tamsulosin: This is one of the most widely used alpha-blockers for BPH. It selectively targets the alpha-1A receptors primarily located in the prostate, offering symptom relief with a lower risk of side effects compared to non-selective alpha-blockers.

Alfuzosin: A selective alpha-1 receptor blocker that is also commonly used in treating BPH. It relaxes the smooth muscles of the prostate and bladder neck.

Doxazosin: A non-selective alpha-blocker that not only targets the prostate but also the vascular smooth muscles, which can reduce blood pressure. It is sometimes used in men with BPH who also have hypertension.

Benefits

Symptom Relief: Alpha-blockers are highly effective in providing quick symptom relief. Within a few days to weeks, they can improve urinary symptoms, including reduced frequency, urgency, and nocturia.

Improvement in Urinary Flow: By relaxing the smooth muscles in the prostate and bladder neck, alpha-blockers significantly improve urinary flow rate, reducing the obstruction caused by BPH.

Side Effects and Safety Profile

While alpha-blockers are generally well tolerated, they may have side effects, including:

Orthostatic Hypotension: A sudden drop in blood pressure upon standing, especially with non-selective alpha-blockers (e.g., doxazosin).

Dizziness: Related to the blood pressure-lowering effects.

Ejaculatory Dysfunction: Reduced ejaculation or retrograde ejaculation may occur, particularly with tamsulosin.

Fatigue: Some patients may experience tiredness or weakness.

B. 5-Alpha-Reductase Inhibitors: 5-alpha-reductase inhibitors work by blocking the enzyme 5-alpha-reductase, which converts testosterone into its more potent form, dihydrotestosterone (DHT). DHT plays a critical role in the development and enlargement of the prostate. By reducing the levels of DHT in the prostate, these inhibitors can slow or reverse prostate growth, thereby improving symptoms associated with BPH[14, 15].

Commonly Prescribed Drugs

Finasteride: This drug specifically inhibits the Type 2 isoform of 5-alpha-reductase. It is one of the most commonly used medications for long-term treatment of BPH.

Dutasteride: A more potent 5-alpha-reductase inhibitor, dutasteride inhibits both Type 1 and Type 2 isoforms of the enzyme, leading to a more comprehensive reduction in DHT levels.

Benefits

Long-term Reduction in Prostate Size: 5-alpha-reductase inhibitors can shrink the size of the prostate by reducing DHT levels, which helps alleviate obstruction and improves urinary symptoms.

Symptom Relief: Over time, these medications can lead to significant improvement in symptoms like reduced urgency and frequency of urination.

Prevention of Acute Urinary Retention: By reducing prostate volume, 5-alpha-reductase inhibitors can reduce the likelihood of acute urinary retention, a potential complication of BPH.

Side Effects and Long-Term Safety

Sexual Dysfunction: Common side effects include decreased libido, erectile dysfunction, and ejaculatory dysfunction.

Breast Tenderness or Enlargement: Some men may experience changes in breast tissue, including tenderness or enlargement.

Potential Risk of Prostate Cancer: Although the long-term use of finasteride and dutasteride may decrease the risk of prostate cancer overall, there is an increased risk of high-grade prostate cancer, which remains a concern.

Teratogenic Effects: These drugs should not be handled by pregnant women as they can cause birth defects in male fetuses.

C. Combination Therapy

Rationale for Combining Alpha-Blockers and 5-Alpha-Reductase Inhibitors

Combination therapy is used for patients with moderate to severe BPH symptoms who either do not respond adequately to one class of medication or who have a significantly enlarged prostate. Combining alpha-blockers with 5-alpha-reductase inhibitors allows for both symptomatic relief and long-term reduction in prostate size. While alpha-blockers provide rapid symptom improvement, 5-alpha-reductase inhibitors work more slowly to address the underlying prostate enlargement[16, 17].

Evidence Supporting Combination Therapy

Combination therapy is more effective than monotherapy in reducing symptoms and prostate volume in BPH. The CombAT trial demonstrated that combining tamsulosin with finasteride improved symptoms, urinary flow rate, and prostate size compared to either drug alone. Combination drugs like dutasteride + tamasulosin and finasteride + doxazosin offer both symptom relief and long-term prostate volume reduction[18, 19]. Combination therapy is generally more effective in managing BPH symptoms compared to monotherapy, providing immediate relief from symptoms and long-term benefits in terms of prostate shrinkage. However, side effects of combination therapy may be more pronounced, including sexual dysfunction, dizziness, and potential cardiovascular effects due to alpha-blockers. Long-term use of 5-alpha-reductase inhibitors may carry the risk of sexual side effects and breast changes.

The pharmacological management of BPH has evolved with various treatment options, with alpha-blockers providing quick symptom relief and 5-alpha-reductase inhibitors offering long-term benefits. Combination therapy is increasingly favored for more severe cases or when monotherapy is insufficient. The selection of treatment should be tailored to the individual patient, considering the severity of symptoms, prostate size, and potential side effects.

Emerging Pharmacological Therapies

Emerging pharmacological therapies for managing benign prostatic hyperplasia (BPH) include Phosphodiesterase-5 inhibitors, selective estrogen receptor modulators (SERMs), beta-3 agonists, and novel drugs targeting growth factors and signaling pathways. PDE5 inhibitors inhibit the degradation of cyclic guanosine monophosphate (cGMP) by PDE5, leading to smooth muscle relaxation in the prostate, bladder neck, and pelvic vasculature. They enhance nitric oxide-mediated signaling pathways and have been shown to improve lower urinary tract symptoms (LUTS) associated with BPH[20, 21].

SERMs modify estrogen receptor activity selectively in different tissues, potentially addressing the role of estrogen in prostatic hyperplasia and inflammation. Early-phase studies suggest SERMs may reduce prostate volume and improve LUTS. Beta-3 agonists activate beta-3 adrenergic receptors in the bladder detrusor muscle, promoting bladder relaxation and increasing storage capacity without impacting voiding. They are effective in managing overactive bladder (OAB) symptoms associated with BPH and are being evaluated in BPH-associated OAB. Non-alcoholic fatty liver disease (NAFLD) is another emerging therapy that targets growth factors and signaling pathways, such as fibroblast growth factors (FGFs) and transforming growth factor-beta (TGF-β). These drugs show potential in reducing fibrosis and prostatic inflammation, targeting FGF receptors, and showing promising preclinical results in halting stromal proliferation[22]. These emerging therapies could provide disease-modifying therapies that address the underlying pathology of BPH rather than symptom relief alone. They are likely to complement or synergize with existing therapies such as 5-alpha reductase inhibitors and alpha-blockers. This approach outlines the mechanisms, evidence, and future potential of these emerging therapies, paving the way for more targeted and effective BPH management strategies.

Comparison of Current and Emerging Therapies

This framework provides a comprehensive comparison of current and emerging therapies for Benign Prostatic Hyperplasia (BPH) based on various factors. Current therapies include alpha-blockers, which improve symptoms, 5-alpha-reductase inhibitors, which gradually reduce prostate size over months, and combination therapy, which offers superior symptom relief. Emerging therapies include prostate-specific therapies, laser and minimally invasive surgical approaches, gene therapy, and stem cell approaches. Current therapies also aim to reduce prostate volume, with 5-alpha-reductase inhibitors reducing prostate size by 20-25% over time. Surgical options like transurethral resection of the prostate (TURP) effectively reduce prostate volume but are invasive. Focal therapies, such as high-intensity focused ultrasound and focal laser ablation, aim to target and reduce specific prostate zones with minimal collateral damage[23]. Overall Quality of Life (QoL) is improved in both current and emerging therapies, with emphasis on minimally invasive approaches and reduced downtime. Short-term side effects include dizziness, orthostatic hypotension,

and ejaculatory dysfunction, while long-term risks include sexual dysfunction, gynecomastia, and potential psychological effects. Comparing safety in different patient populations is essential, with older men having higher risks of dizziness and hypotension with alpha-blockers, while patients with comorbidities have potential fewer systemic interactions. Emerging therapies may offer higher initial costs but potential long-term cost savings due to reduced recurrence and medication needs.

The economic burden of BPH and treatment options can be further analyzed, with current therapies contributing to significant healthcare expenses and requiring rehospitalizations after invasive surgeries. Emerging therapies may reduce hospital stays, complications, and downstream costs, offering potential long-term economic benefits.

Future Directions and Challenges in BPH Pharmacotherapy

Personalized Medicine: Genetic and Biomarker-Based Approaches to Treatment: Advances in pharmacogenomics have opened the door for tailoring therapies based on genetic predispositions and biomarkers. This approach could improve drug efficacy and minimize adverse effects in patients with benign prostatic hyperplasia (BPH). Identifying biomarkers associated with disease progression or treatment response will be instrumental in guiding therapy choices.

Tailoring Therapy to Individual Patient Needs: A deeper understanding of patient-specific factors such as comorbidities, age, and lifestyle will allow for more precise treatment regimens. This could involve selecting the optimal pharmacological agent, dose, and timing for individual cases.

Development of New Drug Classes; Focus on Innovative Drug Discovery and Novel Targets: Research into the molecular and cellular mechanisms underlying BPH offers opportunities to identify new therapeutic targets. Emerging pathways related to androgen signaling, inflammation, and stromal-epithelial interactions are promising areas for drug discovery.

Challenges in Clinical Development and Regulatory Approval: Developing novel therapies often encounters hurdles, including extensive safety and efficacy testing, lengthy clinical trial timelines, and stringent regulatory requirements. Balancing innovation with these challenges remains a critical issue for the pharmaceutical industry.

Combination Strategies

Advancements in Fixed-Dose Combination Therapies: Combining drugs with complementary mechanisms of action (e.g., alpha-blockers and 5-alpha reductase inhibitors) has shown improved clinical outcomes in BPH management. Future developments may include fixed-dose combinations that enhance patient adherence and reduce polypharmacy risks.

Future Role of Multi-Target Drugs: Multi-target drugs capable of addressing multiple pathways involved in BPH pathogenesis may provide a more holistic treatment approach. These agents could simplify treatment regimens while maintaining or improving therapeutic outcomes. Advancing BPH pharmacotherapy requires integrating personalized medicine, exploring novel drug classes, and optimizing combination therapies. Overcoming challenges in biomarker identification, regulatory processes, and multi-target drug design will shape the future of patient-centered care in BPH management.

CONCLUSION

Benign prostatic hyperplasia (BPH) remains a significant health concern for aging men, requiring effective management strategies to improve quality of life and reduce complications. Current pharmacological treatments, including alpha-blockers and 5-alpha-reductase inhibitors**,** have shown efficacy in alleviating lower urinary tract symptoms and halting disease progression. Combination therapies further enhance treatment outcomes by addressing both dynamic and static components of bladder outlet obstruction. Despite these advancements, limitations such as incomplete symptom resolution, side effects, and variable patient responses highlight the need for novel therapeutic approaches. Emerging drugs targeting new molecular pathways, such as phosphodiesterase inhibitors**,** beta-3 adrenergic agonists**,** and anti-inflammatory agents**,** offer promising alternatives. Additionally, advancements in precision medicine, including pharmacogenomics and biomarker-guided therapies, hold potential for personalized treatment plans, improving efficacy while minimizing adverse effects. Future research should focus on long-term safety profiles, optimal treatment combinations, and the integration of innovative agents to further refine BPH management. By leveraging these advancements, clinicians can better address the multifaceted nature of BPH, offering improved outcomes for patients.

REFERENCES

1. Ibiam, U.A., Uti, D.E., Ejeogo, C.C., Orji, O.U., Aja, P.M., Nwamaka, E.N., Alum, E.U., Chukwu, C., Aloke, C., Itodo, M.O., Agada, S.A., Umoru, G.U., Obeten, U.N., Nwobodo, V.O.G., Nwadum, S.K., Udoudoh, M.P.: Xylopia aethiopica Attenuates Oxidative Stress and Hepatorenal Damage in Testosterone Propionate-Induced Benign Prostatic Hyperplasia in Rats. Journal of Health and Allied Sciences NU. 14, 477–485 (2024). https://doi.org/10.1055/s-0043-1777836
2. Ibiam, U.A., Uti, D.E., Ejeogo, C.C., Orji, O.U., Aja, P.M., Nwamaka, E.N., Alum, E.U., Chukwu, C., Aloke, C., Chinedum, K.E., Agu, P., Nwobodo, V.: In Vivo and in Silico Assessment of Ameliorative Effects of Xylopia aethiopica on Testosterone Propionate-Induced Benign Prostatic Hyperplasia. Pharmaceutical Fronts. 05, e64–e76 (2023). https://doi.org/10.1055/s-0043-1768477

3. Cao, D., Sun, R., Peng, L., Li, J., Huang, Y., Chen, Z., Chen, B., Li, J., Ai, J., Yang, L., Liu, L., Wei, Q.: Immune Cell Proinflammatory Microenvironment and Androgen-Related Metabolic Regulation During Benign Prostatic Hyperplasia in Aging. Front. Immunol. 13, (2022). https://doi.org/10.3389/fimmu.2022.842008
4. Chen, B., Cao, D., Chen, Z., Huang, Y., Lin, T., Ai, J., Liu, L., Wei, Q.: Estrogen regulates the proliferation and inflammatory expression of primary stromal cell in benign prostatic hyperplasia. Translational Andrology and Urology. 9, 32231–32331 (2020). https://doi.org/10.21037/tau.2020.02.08
5. Chen, J., Chen, B., Lin, B., Huang, Y., Li, J., Li, J., Chen, Z., Wang, P., Ran, B., Yang, J., Huang, H., Liu, L., Wei, Q., Ai, J., Cao, D.: The role of gut microbiota in prostate inflammation and benign prostatic hyperplasia and its therapeutic implications. Heliyon. 10, e38302 (2024). https://doi.org/10.1016/j.heliyon.2024.e38302
6. Fu, X., Wang, Y., Lu, Y., Liu, J., Li, H.: Association between metabolic syndrome and benign prostatic hyperplasia: The underlying molecular connection. Life Sciences. 358, 123192 (2024). https://doi.org/10.1016/j.lfs.2024.123192
7. Benign prostatic hyperplasia (BPH) - Symptoms and causes, https://www.mayoclinic.org/diseases-conditions/benign-prostatic-hyperplasia/symptoms-causes/syc-20370087
8. Enlarged Prostate (Benign Prostatic Hyperplasia) - NIDDK, https://www.niddk.nih.gov/health-information/urologic-diseases/prostate-problems/enlarged-prostate-benign-prostatic-hyperplasia
9. Speakman, M.J., Cheng, X.: Management of the complications of BPH/BOO. Indian J Urol. 30, 208–213 (2014). https://doi.org/10.4103/0970-1591.127856
10. Mobley, D., Feibus, A., Baum, N.: Benign prostatic hyperplasia and urinary symptoms: Evaluation and treatment. Postgrad Med. 127, 301–307 (2015). https://doi.org/10.1080/00325481.2015.1018799
11. Ng, M., Leslie, S.W., Baradhi, K.M.: Benign Prostatic Hyperplasia. In: StatPearls. StatPearls Publishing, Treasure Island (FL) (2025)
12. Nachawati, D., Patel, J.B.: Alpha-Blockers. In: StatPearls [Internet]. StatPearls Publishing (2023)
13. Schwinn, D.A., Roehrborn, C.G.: α1-Adrenoceptor subtypes and lower urinary tract symptoms. Int J Urol. 15, 193–199 (2008). https://doi.org/10.1111/j.1442-2042.2007.01956.x
14. Chislett, B., Chen, D., Perera, M.L., Chung, E., Bolton, D., Qu, L.G.: 5-alpha reductase inhibitors use in prostatic disease and beyond. Transl Androl Urol. 12, 487–496 (2023). https://doi.org/10.21037/tau-22-690
15. Farrant, M., Page, S.T.: Androgens and Benign Prostatic Hyperplasia☆. In: Huhtaniemi, I. and Martini, L. (eds.) Encyclopedia of Endocrine Diseases (Second Edition). pp. 775–783. Academic Press, Oxford (2018)
16. Roehrborn, C., Heaton, J.P.W.: Medical Management for BPH: The Role of Combination Therapy. European Urology Supplements. 5, 716–721 (2006). https://doi.org/10.1016/j.eursup.2006.06.010
17. Shum, C.F., Lau, W., Teo, C.P.C.: Medical therapy for clinical benign prostatic hyperplasia: α1 Antagonists, 5α reductase inhibitors and their combination. Asian Journal of Urology. 4, 185–190 (2017). https://doi.org/10.1016/j.ajur.2017.06.002
18. Miller, J., Tarter, T.: Combination therapy with dutasteride and tamsulosin for the treatment of symptomatic enlarged prostate. Clin Interv Aging. 4, 251–258 (2009)
19. Gravas, S., Oelke, M.: Current status of 5α-reductase inhibitors in the management of lower urinary tract symptoms and BPH. World J Urol. 28, 9–15 (2010). https://doi.org/10.1007/s00345-009-0493-y
20. Ganesan, V., Agarwal, D.: Medical Advancements in Benign Prostatic Hyperplasia Treatments. Curr Urol Rep. 25, 93–98 (2024). https://doi.org/10.1007/s11934-024-01199-4
21. O'Quin, C., White, K.L., Campbell, J.R., Myers, S.H., Patil, S., Chandler, D., Ahmadzadeh, S., Varrassi, G., Shekoohi, S., Kaye, A.D.: Pharmacological Approaches in Managing Symptomatic Relief of Benign Prostatic Hyperplasia: A Comprehensive Review. Cureus. 15, e51314. https://doi.org/10.7759/cureus.51314
22. Wynder, J.L., Nicholson, T.M., DeFranco, D.B., Ricke, W.A.: Estrogens and Male Lower Urinary Tract Dysfunction. Curr Urol Rep. 16, 61 (2015). https://doi.org/10.1007/s11934-015-0534-6
23. Welén, K., Damber, J.-E.: Androgens, aging, and prostate health. Rev Endocr Metab Disord. 23, 1221–1231 (2022). https://doi.org/10.1007/s11154-022-09730-z

CITE AS: Nasira A. Sitar (2024). Pharmacological Management of Benign Prostatic Hyperplasia: Reviewing Current and Emerging Drugs. EURASIAN EXPERIMENT JOURNAL OF PUBLIC HEALTH, 7(2):95-99.